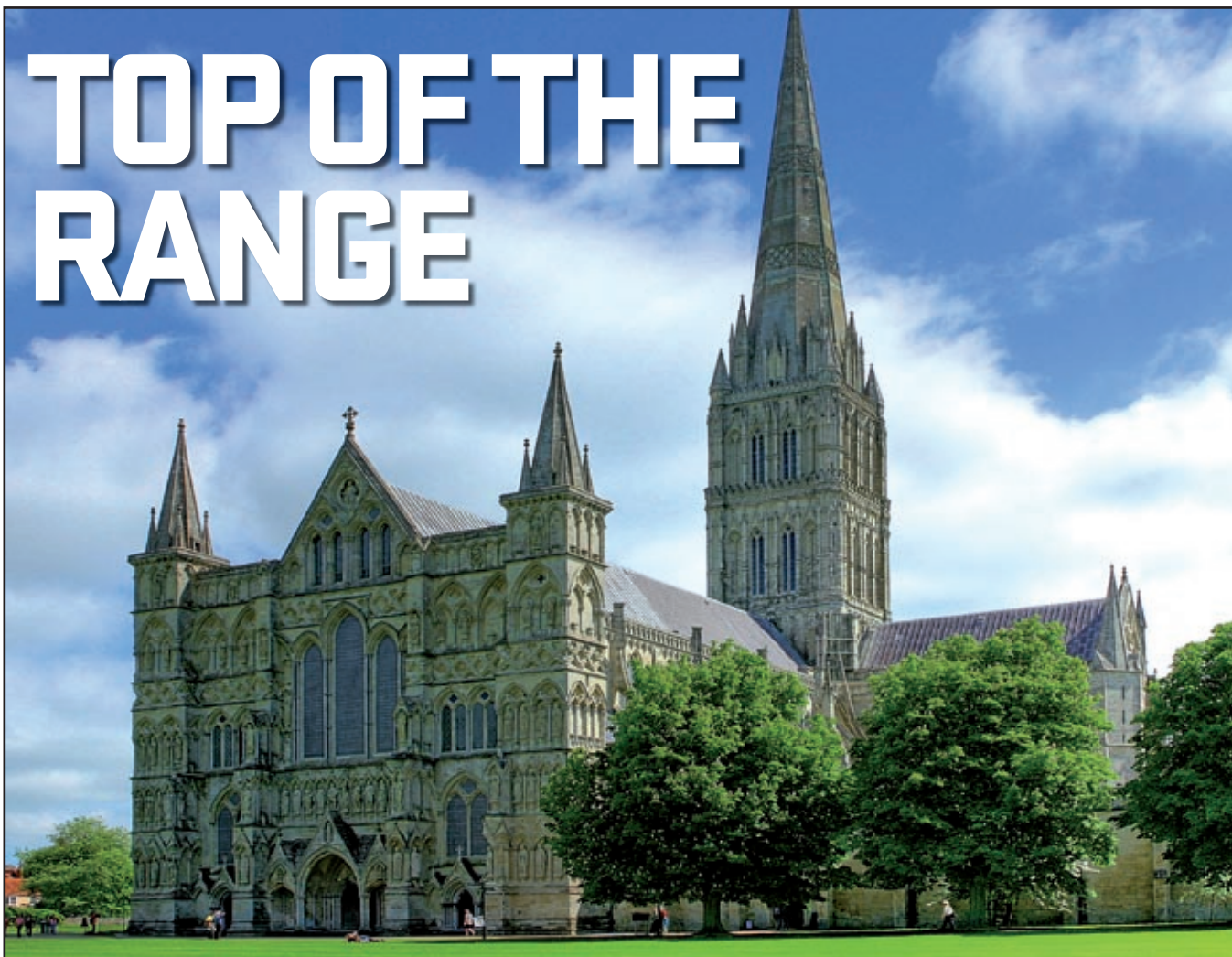




# TOP OF THE RANGE



Stunning digital photos needn't cost you a fortune in fancy equipment. You can create them easily using high dynamic range software, as **Gordon Laing** explains

**D**igital cameras may boast ever-increasing resolutions but, like film cameras, they're capable of capturing only a limited range of tones from light to dark. This explains why many photographs rarely measure up to what we experience in person. We may see faint wispy clouds in bright skies, but our cameras often just capture a great expanse of white, while subtle details in dark shadows can be lost in a solid, featureless black.

The range of tones a camera can capture is known as its dynamic range. Think of it as a relatively short bar positioned on a longer line, which represents real-life tones with pitch black at one end and intense brightness at the other. By adjusting the camera's exposure, you can shift this small bar to the left or right extremes of the longer line to capture detail in dark shadows or bright highlight areas, or just leave it in the middle to record average mid-tones. Sadly, the limited dynamic range of digital cameras means you can't capture a complete range of tones in a single photograph. Or can you?

Photographers have long exploited exposure bracketing to capture multiple variations of the same scene. Shorter and longer exposures can reveal detail in bright and dark areas respectively, complementing the range of tones captured in a normal shot. By taking the best parts of each separate exposure, you could enjoy photographs that retain detail across a far

wider tonal range. The trick is finding a way to assemble them convincingly.

Photographers used to painstakingly layer and retouch the best portions of multiple images by hand, but now several software utilities can perform the process automatically to generate a single image with a high dynamic range (HDR). HDR was first seen in Photoshop CS2, but is now supported in more affordable packages and is fast becoming a technique of choice for many.

HDR is well suited for landscapes or interiors, but can work wonders with almost any kind of shot. The software tools allow you to be subtle with your extended tonal range or produce outrageous effects. In this article, we'll explain everything you need to know.

## GETTING STARTED

The first step in creating an HDR image is to take several different exposures of the same scene. The goal is to use a range of exposures that will capture all the tonal detail, from dark shadow to bright highlight. The number of images you take is up to you, based on the requirements of the scene itself, though most HDR packages recommend a minimum of three exposures.

For the software to produce a convincing result, each exposure must have a certain degree of overlap in the tonal range it is capturing. The general rule for HDR is to vary the exposure by one stop for every image, which means doubling

or halving the exposure each time. The obvious way to achieve this is to use your camera's exposure compensation controls, but on most cameras these operate only over a limited range of plus or minus two stops, which may not be sufficient for an HDR image with an extreme range of tones. Also, the exposure compensation controls may adjust the exposure by changing the aperture, which is undesirable for HDR as the depth of field will change between images.

The best way of changing the exposure for HDR images is to adjust only the shutter speed. Put your camera into manual mode, set the aperture for the desired depth of field and adjust the shutter speed until your camera reports a correct 'normal' exposure. Take this photo, then double the shutter speed and take another. Repeat this, doubling the shutter speed each time until you have all the required exposures for the brightest areas. The last photograph you take will look very dark.

Put the shutter speed back to where you started, halve it and take a new photo. Repeat this process, halving the exposure each time until you have all the required exposures for the dark areas. The last photo you take will look bright and washed out. While HDR software can work with three images, most photographers take seven, providing three darker and three brighter versions in addition to the 'normal' exposure. Demanding compositions may require



nine different exposures, while simpler ones could get away with five.

### DEALING WITH PROBLEMS

While some HDR programs will attempt to line up multiple images taken by hand, it's a far easier job if the subject matter in each exposure is identical. If you're serious about HDR, mount your camera on a steady tripod to ensure that the composition doesn't change between exposures. If your camera or lens has anti-shake facilities, switch them off when using a tripod to avoid introducing unwanted movement.

To avoid ghosting, it's also important that the actual subjects within the scene don't move between exposures. This means vehicles, people, trees and even clouds should remain as still as possible. Water can prove troublesome, especially if there are boats bobbing up and down on it. That's not to say you can't take HDR photos that include subjects in motion, but it's best suited to static compositions. If it's a windy day, take all your exposures as quickly as possible to avoid too much cloud or foliage motion. We'd also recommend switching from auto to manual focus to avoid further variations between shots.

If you're faced with a composition that would benefit from HDR but you didn't bring a tripod, don't give up on the idea. As mentioned earlier, some HDR programs can line up multiple images taken by hand, which may vary slightly. For the best results, though, minimise any variations between the shots by leaning on a post or fence.

If you think you can get away with using just three different exposures, you could also try a combination of auto-exposure bracketing (AEB) and continuous shooting. AEB automatically takes a brighter and a darker version of a shot following a normal exposure. If your camera is also set for continuous shooting, you could theoretically fire off all three in a second. This quick burst allows you to minimise any variation between shots.

### HDR ON EXISTING IMAGES

As we have explained, HDR software works by combining multiple exposures of the same image. You might think existing photos, where you have only one exposure, couldn't benefit from the HDR treatment, but you may still be able to extract a greater tonal range.

Take an existing image and duplicate it twice. Now use software to make one version twice as bright as the original and the other twice as dark. Finally, feed these three images into your HDR software. It won't have the potential of an image created from genuinely different exposures, but you'll be surprised how well this trick can work. If your camera offers a RAW mode this is ideal, as the files will already contain greater tonal detail than a normal JPEG, just waiting to be extracted.

If you are using RAW files for this trick, it's best to create the brighter and darker versions in dedicated RAW processing programs, as these can unlock their full tonal range. If your camera supports RAW files, it will have come with RAW software. However, many third-party tools will also do the job, such as Adobe Camera RAW, which is part of Photoshop, and Bibble ([www.bibblelabs.com](http://www.bibblelabs.com)), which costs \$130 (around £65). This degree of flexibility is a great reason to shoot in RAW instead of JPEG mode.

### ASSEMBLING THE IMAGES

Once you have multiple exposures of the same scene, you can assemble them in HDR software. There are three main choices: Photomatrix Pro, FDRTools and the 'Merge to HDR' option of Photoshop from CS2 onwards. Photomatrix Pro costs around £50, FDRTools costs from £20 and the latest version of Photoshop CS3 is a hefty £569, although it offers a great deal more besides HDR. Free trials of each program are available. You can find out more by visiting [www.hdrsoft.com](http://www.hdrsoft.com), [www.fdrtools.com](http://www.fdrtools.com) and [www.adobe.co.uk](http://www.adobe.co.uk) respectively.

Each program works slightly differently, but they all follow the same basic process. First, you select a number of files, then you let the software crunch the numbers. It can be intensive stuff, so depending on the number and resolution of the files and the speed of your PC, you could be waiting several seconds, or even minutes, for the process to complete.

### VIEWING AND PRINTING

After the initial processing is complete, most HDR programs generate an image with up to 32 bits of dynamic range. This is a massive improvement on the eight-bit tonal range of standard JPEGs. Unfortunately, most displays cannot show more than eight or 10 bits of tonal range, while physical prints can be more limited still. HDR may extend the dynamic range of an image, but what's the point if you can't see it?

Luckily, it is possible to compress the massive dynamic range of the HDR file into something you can see. This works in a similar way to tools such as Levels and the Histogram, found in all image-editing programs, which can adjust the tonal range of normal images. But now, with 32 bits to play with, you have plenty of latitude for adjustment. Since most image-editing programs wouldn't know what to do with a 32-bit file, this adjustment is normally performed within the HDR software.

Most HDR programs offer a number of Tone Mapping options that allow you to express a preference as to which tones get priority during the conversion to a more usable 16- or eight-bit image. As with all types of photo retouching, this can be as subtle or extreme as you like. You may

want a discreet approach with an image that looks natural; others may prefer a result that is clearly artificial, but quite dramatic.

This is down to personal preference and a degree of trial and error. As with all software adjustments, there are tell-tale signs that can reveal HDR processing to those in the know, such as impossibly dark and detailed clouds looming over an otherwise normal-looking landscape. Ultimately, though, there are no hard and fast rules; just experiment until you get a result that looks good to you.

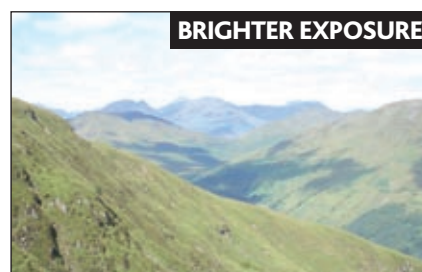
To view a wide variety of HDR subjects and techniques, visit Flickr's dedicated HDR group at [www.flickr.com/groups/hdr](http://www.flickr.com/groups/hdr). For expert examples of subtle processing at work, visit Sean T McHugh's galleries of shots taken around Cambridge at [www.cambridgeincolour.com](http://www.cambridgeincolour.com).

### ENJOYING THE BENEFITS

HDR is a very powerful tool for greatly extending the dynamic range of images. It may not be appropriate for every photograph, but it can prove invaluable for tricky shots where a single exposure is too great a compromise when you are trying to capture the range of tones that you can see with your own eyes. It's particularly good for retaining detail in bright, overcast skies or for getting the most from interior and long-exposure shots.

HDR also addresses one of the technical concerns of ever-increasing camera resolutions. As manufacturers increase the number of pixels on a sensor without making the sensor physically bigger, it's not just the sensitivity that suffers. Dynamic range is also reduced. However, by combining multiple exposures, HDR allows you to capture a greater tonal range than you ever thought possible. This layering can even reduce electronic noise levels.

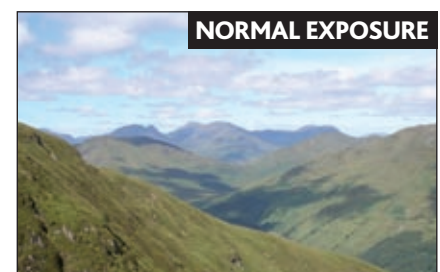
Like all digital manipulations, however, it's very easy to go over the top with HDR and produce images that look completely unnatural. Of course, this might be the desired effect, but unless you want to create a fantasy scene we'd recommend reining yourself in a little. If you're careful, HDR can deliver very natural-looking results yet with a range of tones that your camera is unable to deliver in a single exposure.



BRIGHTER EXPOSURE



DARKER EXPOSURE



NORMAL EXPOSURE



▲ To create an HDR image, you'll need at least three exposures: one bright, one normal and one darker. These are then combined in an HDR program (see bottom right)